

## CENSUS 2000: ECONOMY AND LABOR FORCE

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## Characteristics of Workers in Washington High-Tech Industries

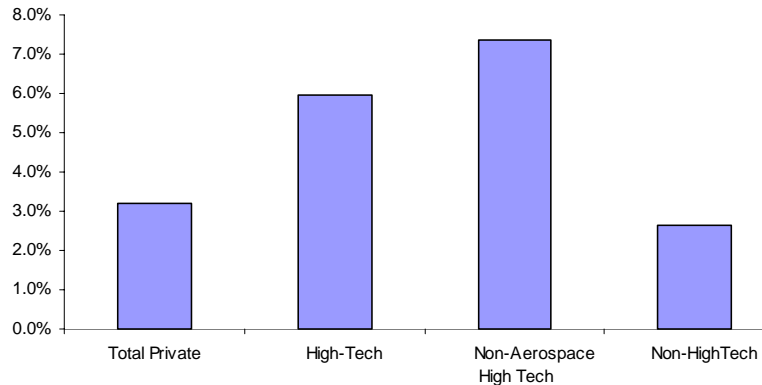
By Ta-Win Lin

In the second half of the 1990s, investment in high-tech infrastructure such as the Internet and business computer network systems, widespread use of information technology, and the evolution of “e-commerce” helped produce a U.S. economic boom. The same happened in Washington state. State total employment during this period grew at an average annual rate of 3.2 percent, while growth of the state’s high-tech industries<sup>1</sup> was much higher, at a yearly rate of 6.0 percent. Excluding the aircraft and parts industry sector, the high-tech sectors in the state grew at an even more astounding rate of 7.4 percent annually (Figure 1).

The fast-growing high-tech sectors created a special group of workers who have been perceived by some people to be quite different from the rest of the workforce. This research brief examines some socioeconomic characteristics of these high-tech workers, using mainly data extracted from the 2000 Census Public Use Microdata Sample (PUMS) file<sup>2</sup>.

The analysis here is conducted from an “industry” perspective. The workers analyzed are those employed in **industries** classified as “high tech.” From an **occupational** standpoint; however, it should be remembered that high-tech industries employ workers in both high tech and non-high tech occupations.

Figure 1  
Washington Wage & Salary Employment  
Average Annual Growth Rate 1995-2000



Source: Labor Market and Economic Analysis,  
Washington State Employment Security Department

Figure 2  
Washington High-Tech Workers

Industries	# of Workers	% Total
Manufacturing	156,955	56%
Pharmaceutical and medicine	2,501	1%
Computer and peripheral equipment	8,590	3%
Communications, audio, and video equipment	4,615	2%
Navigational/measuring/electromedical/control instruments	6,679	2%
Electronic component and product, n.e.c.	22,371	8%
Household appliance	808	0%
Electrical lighting, equipment, and supplies	4,466	2%
Aircraft and Aerospace products and parts	106,925	38%
Services	124,813	44%
Software publishing	16,859	6%
Wired telecommunications carriers	19,936	7%
Other telecommunication	12,210	4%
Data processing	4,717	2%
Computer systems design and related services	37,570	13%
Scientific research and development	15,227	5%
Other health care services	18,294	6%
Total	281,768	

<sup>1</sup> There are several different definitions of “High-Tech” industries. Some focus on the high-tech components in the products produced; others use as defining criterion the amount of technology used in the production process. Also, the institutions involved in the discussion affect the adopted definition; for example, the most popular American Electronic Association’s (AEA) definition is tilted toward one composed of high-tech hardware manufacturers. The definition used in this study approximates the one defined by the Washington Technology Center (WTC), covering both high-tech manufacturing and services (see Figure 2).

<sup>2</sup> 5% PUMS file for Washington state, released 2003.

By 2000, high-tech employment accounted for 7.7 percent of total workers in Washington. Among the 282,000 high tech workers, 38 percent were in aerospace and aircraft production, 18 percent in other manufacturing industries, and 44 percent in services (Figure 2). Excluding aerospace and aircraft, there were actually more high-tech services workers than high-tech manufacturing workers in the state. Second to aircraft and parts, computer system design and related services was another major high-tech sector, accounting for 13 percent of total high-tech industry workers.

### Demographic Characteristics of Workers in Washington High-Tech Industries

About 58.0 percent of high-tech workers are in the age group 26-45, while the same age cohort accounted for a much lower 46.5 percent share of workers in non-high tech industries (Figure 3). Excluding aircraft and aerospace production industries, nearly one-third of the rest of high-tech workers were in the 26-35 age cohort; by comparison, just 22 percent of non-high tech workers were in this age group.

Most of the very young working age group of 16-25 worked in non-high tech sectors, reflecting the fact that a large portion of these young workers did not have sufficient educational preparation required by high-tech businesses. Over 56 percent of high-tech workers had a bachelor's or graduate degree, substantially higher than the 39 percent share of those in non-high tech industries (Figure 4).

High-tech workers are predominantly male. In 2000, 63 percent of high-tech workers were men; in contrast, the male/female split was fairly even in non-high tech sectors – 51.2 percent versus 48.8 percent. However, the gender difference in high tech industries disappears statistically when the aircraft and aerospace industries are excluded. Excluding these two industries, the rest of high-tech workers had an approximately even male/female distribution. Many of the major aircraft and aerospace occupations, including machinists and engineers, have been historically male dominated.

Contrary to the general belief, the households of high-tech workers are as “traditional” as their non-high tech counterparts. Relative to non-high tech workers, about the same portion of high-tech workers were married. Although the average household size of high-tech workers was slightly smaller, and more high-tech workers live alone (i.e. 1-person household), the differences can be readily explained by the different age profiles of the two worker groups.

Figure 3  
Age Profile of Washington Workers

Age	High-Tech		Non-HighTech Industries
	All	excl. Aircraft	
16-25	8.7%	12.0%	19.9%
26-35	25.8%	32.2%	21.9%
36-45	32.2%	29.3%	24.6%
46-55	21.4%	18.7%	19.8%
56-65	9.8%	6.4%	9.7%
66+	2.1%	1.5%	4.1%
Total	100.0%	100.0%	100.0%

Figure 4  
Demographics of Washington Workers

(Age 26-55)	High-Tech		Non-HighTech Industries
	All	excl. Aircraft	
Sex			
Male	63.4%	50.2%	51.2%
Female	36.6%	49.8%	48.8%
Marital Status			
Now married	64.9%	65.2%	65.1%
Divorced	14.4%	14.6%	14.7%
Never married	18.5%	17.0%	17.1%
Separated/Widowed	2.2%	3.2%	3.2%
Household Size			
1	22.7%	24.6%	22.1%
2	27.2%	28.8%	26.0%
3	17.5%	17.7%	18.4%
4	20.2%	17.6%	19.3%
5+	12.3%	11.2%	14.2%
Average HH Size	2.78	2.67	2.87
Educational Attainment			
High school degree and below	17.5%	13.9%	33.1%
Some college, no degree	25.9%	23.3%	27.5%
Associate degree	10.2%	9.9%	9.7%
Bachelor's degree and above	46.5%	52.9%	29.7%

## Employment Characteristics of Workers in Washington High-Tech Industries

Seven out of ten high-tech workers are concentrated in five occupations: management (14.2%), computer and mathematic science (17.7%), architecture and engineering (11.9%), office and administrative support (14.1%) and production workers (13.7%). In contrast, only 37 percent of workers in non-high tech industries were in these five occupations (Figure 5). On the other hand, high-tech jobs were much less concentrated in sales, food preparation and serving, transportation and moving, and education/training.

Figure 5  
Occupational Profile of Washington Workers

Occupation	% of Total Workers			% of Total Workers	
	All	High-Tech excl. Aircraft	Non-HighTech Industries	High-Tech	Manufacturing* Non-HighTech
Management	14.2%	16.4%	8.3%	11.8%	8.5%
Business and financial operations	5.1%	4.7%	3.9%	5.4%	2.5%
Computer and mathematic science	17.7%	23.2%	1.4%	9.2%	1.5%
Architecture and engineering	11.9%	6.3%	1.7%	18.8%	3.7%
Life, physical, and social science	2.3%	3.5%	0.9%	0.6%	0.9%
Community and social services	0.2%	0.3%	1.6%	0.0%	0.0%
Legal - Lawyer & judicial	0.2%	0.2%	0.6%	0.0%	0.0%
Legal - Legal assistants/support	0.2%	0.3%	0.4%	0.1%	0.0%
Education/training/library	0.5%	0.4%	5.4%	0.5%	0.2%
Arts/designs/entertainment/sports/media	2.3%	2.5%	2.1%	2.0%	1.4%
Healthcare practitioner & technical service	3.8%	6.0%	6.1%	0.3%	0.3%
Protective service	0.3%	0.2%	1.7%	0.4%	0.3%
Food preparation and serving related	0.2%	0.3%	6.0%	0.2%	0.4%
Building/grounds cleaning & maintenance	0.5%	0.3%	3.8%	0.7%	1.3%
Personal care and service	0.2%	0.3%	3.9%	0.0%	0.1%
Sales and related	2.8%	4.1%	12.1%	1.8%	4.1%
Office and administrative support	14.1%	15.4%	15.1%	12.2%	10.0%
Farming, fishing, and forestry	0.0%	0.0%	2.1%	0.0%	0.8%
Construction and extraction	1.3%	0.3%	6.1%	2.1%	3.9%
Installation, maintenance, and repair	7.3%	5.2%	3.7%	8.3%	5.6%
Production	13.7%	9.2%	6.2%	23.3%	44.5%
Transportation and material moving	1.4%	0.9%	6.8%	2.2%	10.1%
Total	281,768	174,843	3,340,157	156,955	286,477

\* Manufacturing industries include Census 2000 industrial coding categories 107-399

Most of the difference in occupational distributions between high-tech and non-high tech workers can be attributable to the respective industries they belong to. In manufacturing, however, production workers accounted for 44.5 percent of non-high tech workforce, almost double their 23.3 percent share for high-tech workers.

Wages earned by high-tech workers amounted to \$13.9 billion in 1999, about 14 percent of total wages paid to workers in the state; the high-tech industries' wage share was nearly double their employment share. For most of the occupational categories, high-tech workers commanded substantially higher wages than their non-high tech counterparts. The high-tech industries' requirements for longer working hours and for higher worker skills/education (Figure 6) contributed to their high wages. For example, 69 percent of high-tech management positions were held by college graduates, while in non-high tech sectors only 47 percent of managers had a college degree; and those with a bachelor degree accounted for 53 percent of sales and related positions in high-tech industries, double the respective share of 26 percent in non-high tech sectors. Also, for many occupations average weekly working hours of those in the high-tech sectors were more than 10 percent higher than their non-high tech counterparts. Since a disproportionate share of high tech jobs are located in the Puget Sound area, wage differences between high tech and non high tech workers may also be explained by the higher cost of living in the Puget Sound region.

Longer working hours, higher education/skills, and geography may not fully explain the large wage gaps observed for some occupations. What remains is an industry-or firm-specific effect, namely: high wage levels of some occupations in high-tech businesses pull up the wages of other jobs within the same business.

Figure 6  
Difference in Median Wages, by Occupation

Occupation (Age 25+)	Median Wages (1999)			Difference Hi-Tech(All) - Non-HiTech
	All	High-Tech excl. Aircraft	Non-HighTech Industries	
Management	68000	65000	45000	51%
Business and financial operations	43000	39000	36000	19%
Computer and mathematic science	57000	55000	45500	25%
Architecture and engineering	55000	45000	48200	14%
Life, physical, and social science	46000	40000	39000	18%
Community and social services	28000	24100	29000	-3%
Legal - Lawyer & judicial	87000	87000	65000	34%
Legal - Legal assistants/support	43000	43000	29500	46%
Education/training/library	45500	40000	28000	63%
Arts/designs/entrainment/sports/media	47000	42000	29000	62%
Healthcare practitioner & technical service	30000	25000	30000	0%
Protective service	40000	33000	38000	5%
Food preparation and serving related	26000	26000	13300	95%
Building/grounds cleaning & maintenance	33000	22000	15600	112%
Personal care and service	14100	10000	14000	1%
Sales and related	48000	43000	27500	75%
Office and administrative support	32300	28000	24000	35%
Farming, fishing, and forestry	15300		13500	13%
Construction and extraction	50000	45000	34100	47%
Installation, maintenance, and repair	48000	40000	35000	37%
Production	40000	23000	27000	48%
Transportation and material moving	42300	16000	28000	51%

### Migration Characteristics of Workers in High-Tech Industries <sup>3</sup>

Excluding aircraft and aerospace, about one in every four high tech industry workers migrated to Washington from another state or nation. For the software publishing industry, 41 percent of workers in the year 2000 were new immigrants to the state.

Immigration from other U.S. states and foreign countries is a major source of the high-tech labor pool. Including aircraft and parts, almost 19 percent of high-tech workers and 16.0 percent of non-high tech workers were new residents, moving into Washington during the 5-year period between 1995 and 2000 (Figure 7). Out-of-state immigration thus contributed an annual average 4.2 percentage points to the state's high-tech employment growth between 1995 and 2000.

About one-fifth of the new high-tech immigrants came from other countries. For the high-tech service industries, the proportion of foreign immigrant workers was higher at 25 percent. Communication equipment and electrical equipment manufacturing, software publishing, computer system design, and scientific research services were the industries with higher-than-average overseas recruitment rates. Software publishing stood out with one-third of its immigrant workers and 13.7 percent of its total workers coming from foreign countries during the previous five years.

<sup>3</sup> The Census questionnaire asks "Where did this person live 5 years ago?" The migratory status of an individual is then determined by whether he or she lived in Washington in 1995 or not. This operational definition of a person's migratory status thus ignores those who moved into the state before 1995 and those who moved out but then moved back to the state during the 1995-2000 period.

In 2000, about one quarter of high-tech services workers were new residents; in contrast new residents accounted for only 13.6 percent of high-tech manufacturing workers. However, excluding aircraft/aerospace workers, high-tech manufacturing had the same share of new immigrants as high-tech services.

New immigrants accounted for 24.7 percent of workers in high-tech sectors excluding aircraft/aerospace, translating into an average annual contribution of 5.8 percentage points to the sectors' employment growth.

Sectors with the most new immigrant workers tended to be the ones with higher employment growth. For example, the software publishing industry stood out with new move-ins accounting for 41 percent of total employment in 2000, which were accompanied by a very high job growth of 80 percent between 1995 and 2000.

Worker immigration also contributed to the human capital in the state, with 64.8 percent of the newly (i.e. 1995-2000) immigrating high-tech workers possessing a college degree, compared to the 42.3 percent share of those high-tech workers already living in the state before 1995 (Figure 8). The same is true, although to a lesser extent, for non-high tech sectors too—37.2 percent of new immigrant workers had a college degree compared with a 28.2 percent rate for those residing more than five years in the state.

Figure 7  
Immigration of High-Tech Workers

High-Tech Industries	Total Workers	Out-of-State Move-In's* (as % of total workers)		
		All	R-of-US	R-of-World
<b>Manufacturing</b>	<b>156,955</b>	<b>13.6%</b>	<b>11.2%</b>	<b>2.4%</b>
Pharmaceutical and medicine	2,501	28.6%	26.3%	2.3%
Computer and peripheral equipment	8,590	25.0%	20.9%	4.0%
Communications, audio, and video equipment	4,615	24.7%	17.4%	7.3%
Navigational/measuring/electromedical/control	6,679	23.0%	18.9%	4.2%
Electronic component and product, n.e.c.	22,371	25.3%	20.1%	5.2%
Household appliance	808	16.3%	8.8%	7.5%
Electrical lighting, equipment, and supplies	4,466	15.3%	11.1%	4.2%
Aircraft and Aerospace products and parts	106,925	8.8%	7.5%	1.3%
<b>Services</b>	<b>124,813</b>	<b>24.9%</b>	<b>18.8%</b>	<b>6.1%</b>
Software publishing	16,859	41.1%	27.4%	13.7%
Wired telecommunications carriers	19,936	17.8%	15.7%	2.2%
Other telecommunication	12,210	24.4%	20.8%	3.7%
Data processing	4,717	24.7%	21.2%	3.5%
Computer systems design and related services	37,570	26.9%	19.3%	7.6%
Scientific research and development	15,227	22.3%	16.2%	6.1%
Other health care services	18,294	16.1%	13.2%	2.9%
<b>Total High-Tech</b>	<b>281,768</b>	<b>18.6%</b>	<b>14.5%</b>	<b>4.1%</b>
<b>Excluding aircraft/aerospace</b>	<b>174,843</b>	<b>24.7%</b>	<b>18.9%</b>	<b>5.8%</b>
<b>Total Non-High Tech</b>	<b>3,377,588</b>	<b>16.0%</b>	<b>12.9%</b>	<b>3.1%</b>

\* Moved into Washington State between 1995 and 2000

Figure 8  
Educational Attainment of Washington Workers (Age 26-55)

Educational Attainment	1995-2000 Move-Ins			Before-1995 Residents		
	All	High-Tech excl. Aircraft	Non-HighTech Industries	All	High-Tech excl. Aircraft	Non-HighTech Industries
No HS diploma	2.6%	2.3%	11.0%	3.6%	3.4%	9.8%
High school graduate	6.4%	5.6%	18.4%	15.7%	12.5%	24.0%
Some college, no degree	19.1%	19.0%	25.2%	27.4%	24.8%	27.9%
Associate degree	7.0%	6.7%	8.2%	10.9%	10.9%	10.0%
Bachelor's degree	38.6%	39.0%	23.4%	30.5%	34.6%	19.2%
Graduate/Professional Degree	26.2%	27.3%	13.8%	11.8%	13.8%	9.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%